

Notice of Allowability**Application No.**

10/539,387

Applicant(s)

GERRITSEN ET AL.

Examiner

Said Broome

Art Unit

2628

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the amendment filed on 11/1/10.
2. ☒ The allowed claim(s) is/are 2-6,8,9,11-13,15,19 and 20.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some* c) ☐ None of the:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: ____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date ____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date ____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date ____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413),
Paper No./Mail Date 11/15/10.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other ____.

/Said Broome/
Primary Examiner, Art Unit 2628

DETAILED ACTION

Response to Amendment

1. This office action is in response to an amendment filed on 11/1/2010.
2. Claims 2-4, 9, 12, 13, 15 have been amended by the applicant.
3. Claims 5, 6, 8, 11, 19 and 20 have been previously presented.
4. Claims 7, 10, 14, 16-18 and 21 have been cancelled.

Interview Summary

The applicant's representative authorized an examiner's amendment on October 29, 2010 to renumber claims 2-6, 8, 9, 11-13, 15, 19 and 20 to renumber these claims as 1-13 within the Notice of Allowance.

Examiner's Amendment

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in an examiner-initiated telephone interview with Thomas Kovocsky on October 29, 2010.

Amend claims 2-6, 8, 9, 11-13, 15, 19 and 20 as follows:

~~23~~. The system as claimed in claim ~~92~~,...

~~34~~. The system as claimed in claim ~~92~~,...

- ~~[[4]]~~5. The system as claimed in claim 92,...
- ~~5~~6. The system as claimed in claim ~~[[4]]~~5,...
61. A system for visualizing a three-dimensional (hereinafter "3D") volume,...
- ~~8~~7. The system as claimed in claim 92,
92. A system for visualizing a three-dimensional (hereinafter "3D") volume of a patient,...
- ~~44~~8. The system as claimed in claim 92,...
- ~~42~~9. The system as claimed in claim 92,...
- ~~43~~10. A non-transitory computer readable storage medium storing a computer program...
- ~~45~~11. A method of visualizing a 3D volume representing an anatomical region of a patient,...
- ~~49~~12. The method as claimed in claim ~~45~~11,...
- ~~20~~13. The method as claimed in claim ~~45~~11,...

Allowable Subject Matter

The following is an examiner's statement of reasons for allowance: In regards to claim 6, Argiro et al.(*U.S. Patent 5,986,662*) teaches a system for visualizing a three-dimensional (hereinafter "3D") volume of a patient (*col. 6 lines 19-28*), the system including: an input which receives a three-dimensional set of medical image data representing voxel values of the 3D volume (*col. 4 lines 9-11*), an output which provides pixel values of a two-dimensional (hereinafter "2D") image representation for rendering (*col. 3 lines 10-11*), a processor which, under control of a computer program, processes the medical image data set to obtain the 2D

image representation (*col. 6 lines 19-28*) by performing the steps of: casting a ray from each pixel of the 2D image representation through the volume (*col. 3 lines 1-4*), and traversing along the ray through at least a plurality of ray positions within the volume (*col. 2 line 63 - col. 2 line 8*). However, the prior art fails to teach traversing along the ray through at least a plurality of ray positions within the volume under control of a protocol that determines a rendering algorithm and/or rendering parameters in dependence on the ray position with the determined rendering algorithms and/or rendering parameters being different for some ray positions than the determined rendering algorithm and/or rendering parameters for other ray positions; and for each of the plurality of ray positions using a corresponding one of the determined rendering algorithms/parameters to calculate a contribution to a pixel value of the pixel based on at least one voxel value with a predetermined range of ray positions, wherein the protocol is rule-based; wherein a rule prescribes for each of the plurality of ray positions at least one processing action at least in dependence on processing results of ray position along the ray that already been processed wherein the processing action includes at least one of the following: jumping forward or backward along a ray to a particular ray position, and resuming processing from that position; switching a stepping direction along a ray between forward and backward as seen from the viewpoint; changing a step size that determines a next ray position with respect to a current ray position in the stepping direction; changing a 3-dimensional direction of a ray starting from a particular position; switching to another rendering algorithm; adapting rendering parameters for controlling the rendering algorithm; switching to another feature detection method, which determines the type of information that is going to be visualized by the rendering algorithm, therefore claim 6 is allowable.

In regards to claim 9, Argiro et al.(*U.S. Patent 5,986,662*) teaches a system for visualizing a three-dimensional (hereinafter “3D”) volume of a patient (*col. 6 lines 19-28*), the system including: an input which receives a three-dimensional set of medical image data representing voxel values of the 3D volume (*col. 4 lines 9-11*), an output which provides pixel values of a two-dimensional (hereinafter “2D”) image representation for rendering (*col. 3 lines 10-11*), a processor which, under control of a computer program, processes the medical image data set to obtain the 2D image representation (*col. 6 lines 19-28*) by performing the steps of: casting a ray from each pixel of the 2D image representation through the volume (*col. 3 lines 1-4*), and traversing along the ray through at least a plurality of ray positions within the volume (*col. 2 line 63 - col. 2 line 8*). However, the prior art fails to teach at least one storage which stores protocols for switching among a plurality of feature detection methods and which stores the medical image data set; in accordance with one of the stored protocols selected to select a type of information visualization, selecting one of the plurality of feature detection methods, in dependence on the ray position, the selected one of the plurality of feature detection methods changing with the ray position, the selected feature detection method being different for some of the ray positions of the 2D image than for other ray positions of said 2D image; for each of the plurality of ray positions, calculating a contribution to a corresponding pixel value based on at least one voxel value within a predetermined range of the ray position using the selected one of the feature detection methods for each of the ray positions, therefore renumbered claims 2-6, 8, 9, 11 and 12 are allowable.

In regards to claim 13, Argiro et al.(*U.S. Patent 5,986,662*) teaches a non-transitory computer readable storage medium storing a computer program for causing a processor to

process a three-dimensional set of data representing voxel values of a 3D volume (*col. 6 lines 19-28*) depicting an anatomical region of a patient (*Fig. 3: 122*) to obtain a 2D image having a plurality of pixels of the 3D volume by projecting the 3D volume onto an imaginary 2D projection screen (*col. 4 lines 17-34 and col. 14 lines 25-32*) by controlling the processor to perform the steps of: casting a ray through each pixel of the 2D image and into the 3D volume (*col. 3 lines 1-4*), and stepping along the ray through at least a plurality of ray positions along the ray within the volume under control of a protocol to be implemented for each ray position along the ray (*col. 2 line 63 - col. 2 line 8*). However, the prior art fails to teach from a memory which stores a plurality of rendering algorithms, selecting a subset of the rendering algorithms in accordance with an anatomical region depicted by the 3D volume; casting a ray through each pixel of the 2D image and into the 3D volume; stepping along the ray through a plurality of ray positions along the ray within the volume under control of a protocol that selects one of the subset of rendering algorithms to be implemented for each ray position along the ray, the rendering algorithm selected for some ray positions being different than the rendering algorithm selected for other ray positions along the ray; and for each of the plurality of ray positions, using the selected rendering algorithm to calculate a contribution to a pixel value of the pixel corresponding to the ray based on at least one voxel value within a predetermined range of the ray position, wherein a plurality of different rendering algorithms are used to generate the pixel values of the 2D image from the voxels of the 3D volume, therefore claim 13 is allowable.

In regards to claim 15, Argiro teaches a method of visualizing a 3D volume by processing a three-dimensional set of data representing an anatomical region of a patient (*Fig. 3: 122*), which 3D volume is defined by a three-dimensional set of data representing voxel values of a

3D array of voxels of the 3D volume (*col. 2 line 67 - col. 3 line 4*), as a 2D image defined by pixel values of a 2D array of pixels of a 2D image on an imaginary 2D projection screen (*col. 4 lines 17-34*), the method comprising: with one or more processors (*Fig. 1: 100*); casting a ray from each pixel into the 3D volume (*col. 3 lines 1-4*); and stepping along the ray to each of a plurality of ray positions within the volume under control of a protocol that selects one of the subset of rendering algorithms/parameters in dependence on the ray position along the ray (*col. 2 line 63 - col. 2 line 8*). However, the prior art fails to teach for some of the ray positions along the ray, selecting different rendering algorithms/parameters than for other ray positions along the ray wherein the selected rendering algorithm/parameter for at least one of the ray position along the ray changes to a different rendering algorithm/parameter; for each of the plurality of ray positions along the ray using the selected one of the plurality of rendering algorithms/parameters to calculate a contribution to the pixel value of the pixel of the 2D image that corresponds to the ray; and at least one of displaying the 2D image on a display monitor and storing the 2D image in a computer memory; wherein the different rendering algorithm/ parameter at least one of: switching a stepping direction along the ray; jumping forward or backward along the ray to a particular ray position, and resumes processing from that ray position; changing a step size that determines a next ray position with respect to a current ray position in the stepping direction; changing a 3-dimensional direction of a ray starting from a current ray position; and determining a type of anatomical information that is going to be visualized by the rendering algorithm in the 2D image, therefore renumbered claims 15, 19 and 20 are allowable.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue

fee. Such submissions should be clearly labeled “*Comments on Statement of Reasons for Allowance.*”

Response to Arguments

Applicant’s arguments, see remarks, filed 11/1/10, with respect to claims have been fully considered and are persuasive. The 35 U.S.C. 103(a) rejection of claims 2, 3, 5, 8, 9, 11, 13 and 15 has been withdrawn.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Said Broome whose telephone number is (571)272-2931. The examiner can normally be reached on M-F 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Andrew Wang can be reached on (571)272-0811. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would

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like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Said Broome/

Primary Examiner, Art Unit 2628